

**Claims:**

1. A method of processing a bitstream in a digital video transcoder, comprising:
  - (a) determining an adjustment factor relating a number of bits representing a selected frame defined by said bitstream to a target number of bits for said selected frame;
  - (b) determining an average spatial activity value among sets of video data associated with said selected frame;
  - (c) determining a spatial activity value for a selected set of said sets of video data; and
  - (d) computing a normalized spatial activity value for said selected set of video data in response to said average spatial activity value, said spatial activity value, and a function of said adjustment factor.
2. The method of claim 1, further comprising:
  - (e) adjusting a quantization value associated with said selected set of video data in response to said normalized spatial activity value.
3. The method of claim 2, further comprising:
  - (f) repeating steps (c) through (e) for one or more additional selected sets of said sets of video data.
4. The method of claim 3, further comprising:
  - (g) repeating steps (a) through (f) for one or more additional frames defined by said bitstream.
5. The method of claim 4, wherein said average spatial activity value associated with said selected frame is estimated in response to a previous average spatial activity value associated with a previous frame and a ratio of the number of bits representing said selected frame and a number of bits representing said previous frame.

6. The method of claim 1, wherein said spatial activity value is determined in response to a number of frequency domain coefficients in said selected set of video data.

7. The method of claim 1, wherein said spatial activity value is determined in response to values of frequency domain coefficients in said selected set of video data.

8. The method of claim 1, wherein said spatial activity value is determined in response to a quantization value associated with said selected set of video data.

9. The method of claim 1, wherein said normalized spatial activity value is computed using a second function, defined by:

$$N\_act_j = \frac{f(rcFactor) \times act_j + avg\_act}{act_j + f(rcFactor) \times avg\_act},$$

where  $j$  represents said selected set of video data,  $N\_act_j$  is said normalized spatial activity,  $rcFactor$  is said adjustment factor,  $f$  is said function of said adjustment factor,  $act_j$  is said spatial activity value, and  $avg\_act$  is said average spatial activity value.

10. The method of claim 9, wherein said function of said average spatial activity value is defined by:

$$f(rcFactor) = rcFactor.$$

11. The method of claim 9, wherein said second function is approximated using a piecewise continuous function.

12. The method of claim 9, further comprising:

(e) adjusting a quantization value associated with said selected set of video data in accordance with a third function, defined by:

$$outQL = inQL \times rcFactor \times N\_act_j,$$

where outQL is said adjusted quantization value and inQL is said quantization value.

13. A method of processing a bitstream in a digital video transcoder, comprising:

(a) determining an adjustment factor relating a number of bits representing a selected frame defined by said bitstream to a target number of bits for said selected frame;

(b) determining an average spatial activity value among macroblocks associated with said selected frame;

(c) determining a spatial activity value for a selected macroblock; and

(d) computing a normalized spatial activity value for said selected macroblock in response to said average spatial activity value, said spatial activity value, and a function of said adjustment factor.

14. The method of claim 13, further comprising:

(e) adjusting a quantization value associated with said selected macroblock in response to said normalized spatial activity value.

15. The method of claim 14, further comprising:

(f) repeating steps (c) through (e) for one or more additional selected macroblocks of said macroblocks.

16. The method of claim 15, further comprising:

(g) repeating steps (a) through (f) for one or more additional frames defined by said bitstream.

17. The method of claim 16, wherein said average spatial activity value associated with said selected frame is estimated in response to a previous average spatial activity value associated with a previous frame and a ratio of the number of bits representing said selected frame and a number of bits representing said previous frame.

18. The method of claim 17, wherein each frame defined by said bitstream is one of an I-type, a P-type, and a B-type, and wherein said previous frame and said selected frame are of identical types.

19. The method of claim 17, wherein each frame defined by said bitstream is one of a first type and a second type, said first type being defined by an I-frame or a P-frame, and said second type being defined by a B-frame, and wherein said previous frame and said selected frame are of identical types.

20. The method of claim 13, wherein said spatial activity value is determined in response to discrete cosine transform (DCT) coefficients associated with said selected macroblock.

21. The method of claim 20, wherein step (c) further comprises:

(c1) identifying coded luma blocks in said selected macroblock using a coded block pattern recovered from said bitstream;

(c2) determining a number of DCT coefficients among said identified coded luma blocks; and

(c3) defining said spatial activity value with respect to said number of DCT coefficients among said identified coded luma blocks.

22. The method of claim 20, wherein step (c) further comprises:

(c1) identifying coded luma blocks and coded chroma blocks in said selected macroblock using a coded block pattern recovered from said bitstream;

(c2) determining a number of DCT coefficients among said identified coded luma blocks and coded chroma blocks; and

(c3) defining said spatial activity value with respect to said number of DCT coefficients among said identified coded luma blocks and coded chroma blocks.

23. The method of claim 13, wherein said normalized spatial activity value is computed using a second function, defined by:

$$N\_act_j = \frac{f(rcFactor) \times act_j + avg\_act}{act_j + f(rcFactor) \times avg\_act},$$

where j represents said selected set of frequency domain coefficients,  $N\_act_j$  is said normalized spatial activity, rcFactor is said adjustment factor, f is said function of said adjustment factor,  $act_j$  is said spatial activity value, and avg\_act is said average spatial activity value.

24. The method of claim 23, wherein said function of said average spatial activity value is defined by:

$$f(rcFactor) = rcFactor.$$

25. The method of claim 23, wherein said second function is approximated using a piecewise continuous function.

26. Apparatus for transcoding an input bitstream having a first bit-rate to an output bitstream having a second bit-rate, comprising:

- a decoder for decoding said input bitstream and producing decoded data;
- a quantizer for quantizing said decoded data;
- an encoder for encoding said quantized decoded data and producing said output bitstream; and
- a controller for determining quantization adjustment factors associated with a change from said first bit-rate to said second bit-rate, computing adaptive quantization factors based on said quantization adjustment factors, and controlling a quantization level of said quantizer in accordance with said adaptive quantization factors.

27. Apparatus for processing a bitstream in a digital video transcoder, comprising:

- means for relating a number of bits representing a selected frame defined by said bitstream to a target number of bits for said selected frame to define an adjustment factor;
- means for determining an average spatial activity value among sets of frequency domain coefficients associated with said selected frame, each of said

sets of frequency domain coefficients having at least one frequency domain coefficient;

means for determining a spatial activity value for a selected set of said sets of frequency domain coefficients; and

means for computing a normalized spatial activity value for said selected set of frequency domain coefficients in response to said average spatial activity value, said spatial activity value, and a function of said adjustment factor.

28. A computer readable carrier including program instructions that instruct a computer to perform a method of:

(a) determining an adjustment factor relating a number of bits representing a selected frame defined by said bitstream to a target number of bits for said selected frame;

(b) determining an average spatial activity value among sets of video data associated with said selected frame;

(c) determining a spatial activity value for a selected set of said sets of video data; and

(d) computing a normalized spatial activity value for said selected set of video data in response to said average spatial activity value, said spatial activity value, and a function of said adjustment factor.